Figs. 37–40. *Halticella pusilla*, Fabr. 37, antenna; 38, hind leg; 39, abdomen; 40, scutellum.

41–44. *Hippota pectinicornis*, Latr. 41, antenna (♂); 42, antenna (♀) (after Lucas); 43, hind leg; 44, scutellum (from the type of *Chalcis alexion*, Walk., = *H. pectinicornis* ♀).

45, 46. *Chalcis minuta*, Linn. 45, antenna; 46, hind leg.

No details are figured of the genera *Chalcitella*, Westw., and *Hybothorax*, Ratz.

Description of *Ligula Mansoni*, a new Human Cestode. By Prof. T. Spencer Cobbold, M.D., F.R.S., F.L.S.

[Read December 21, 1882.]

On the 29th of June, 1882, I received from Dr. Patrick Manson, of Amoy, a small bottle containing numerous flattened shreds bearing but slight resemblance to ordinary tapeworms. They were preserved in spirit. The donor, who had the advantage of seeing them in the fresh state, recognized their parasitic character, but entertained a doubt as to their cestode nature. I have often received flattened fibrinous clots resembling parasites; but from the first I conjectured that we had here to deal with immature Ligules. The bottle bore a label with a brief notice to the following effect:—"Tape-like parasites from subperitoneal fascia of Tchai, [who] died, after operation for lympho-elephantoid scrotum, of dysentery, and ulcerated stricture of the œsophagus." The date of this "find" was Sept. 21, 1881; but it was not until the 26th of September of the current year that I found leisure to renew my examination of the specimens. In the interval Dr. Manson furnished me with full particulars of the patient. The MS. was forwarded to the Editor of the 'Lancet,' and the case was published on the 14th of October last. In the account of the *post mortem* there given, Dr. Manson more explicitly states that "a number of parasites, twelve in all, were found lying in the subperitoneal fascia, about the iliac fossæ and behind the kidneys. A single parasite was found lying free in the right pleural cavity. Some of these parasites were coiled up in knots, and others lay extended. On being drawn from under the peritoneum, they exhibited languid movements like those of tapeworm." Further on he states that the worms had a "dead white" appearance and "moved distinctly when taken out of the body."

When I removed the parasites from the bottle, they came

away in a lump; and it took much time to unravel them. This was done under spirit. I then found that there were twelve specimens, of which seven were tolerably perfect, though unnaturally twisted and otherwise distorted. All were evidently much contracted by the action of the spirit. Thus, of the perfect specimens, the shortest measured $1\frac{2}{10}$, and the longest only $3\frac{1}{4}$ inches. In most examples the worm was broader at the head than elsewhere, measuring in that situation precisely $\frac{1}{10}$ of an inch. In one specimen, however, the lower third of the strobile was actually broader than the head—that is to say, it measured exactly $\frac{3}{10}$ of an inch transversely. These measurements were made with great care; but I was not prepared to find that Dr. Manson's examinations had yielded such marked differences of size. In a recent communication he tells me that in the living state the parasites were from twelve to fourteen inches long, $\frac{1}{8}$ of an inch broad, and $\frac{1}{64}$ of an inch in thickness.

With a pocket lens I could everywhere discern transverse rugæ. These, however, were not only more conspicuous in the region of the head, but at the same time more regularly arranged. In several specimens a distinct central longitudinal line was observed, forming a ventral groove which extended from head to tail. In these specimens the dorsal surface also showed indistinct longitudinal lines, apparently due only to a backward folding of the lateral margins of the strobile. Many other grooves, markings, and prominences could be seen with objective glasses of low power; but there was a want of uniformity about them. Even with higher powers I failed to obtain any certain evidence of either reproductive pores without or sexual organs within the strobile. After soaking a specimen for 24 hours in glycerine, the calcareous corpuscles were as distinctly seen as they must have been witnessed by Dr. Manson in the fresh state, judging from a pen-and-ink sketch with which I have been furnished. They are oval, flat bodies, having an average diameter of about $\frac{1}{1000}$ of an inch. After enclosing a portion of the strobile in a tube of melted wax, and allowing it to harden, very thin sections were obtained and examined; but none of these yielded any trace of a testis, of an ovarium, or of an ovum.

Thus it became clear that in *Ligula Mansoni* (for it had been so provisionally named in the 'Lancet') we had to deal with a sexually immature parasite, comparable to the ordinary *Ligula simplicissima* frequently found in the abdominal cavity of fresh-

water fishes. Not only so; further comparison with other hitherto described Ligules showed that it came nearer to *L. simplicissima* than to any other species. Without asserting positively that it may not be a variety of that form, I think we are justified in regarding the human worm as the immature representative of a totally distinct species. The unique character of its habitat, associated with certain differences of form, seem to warrant this conclusion.

Ligula Mansoni, sp. nov.

Strobile flat, with irregular transverse folds, broader in front than behind; head distinct, with regularly arranged rugæ, produced anteriorly to form a papilla, retracted at the point to form a deep sucker-like cup; ventral surface marked by a distinct longitudinal groove in the middle line; reproductive pores wanting.

Length (in the living state) 12 to 14 inches; breadth $\frac{1}{8}$ of an inch; thickness $\frac{1}{64}$ of an inch.

Hab. Cavity of the pleura and subserous aponeurotic membranes of the abdomen of man.

The more one reflects upon what is known of the life-history of the Ligules the more one becomes puzzled to account for this invasion of the human body. The occurrence may fairly be pronounced unique. It is true, indeed, that one other instance has been placed on record where a Ligule was said to have escaped from the human intestine. I allude to the case mentioned by Rudolphi, and already quoted by Dr. Duchamp in his beautiful memoir published in 1876. Parasitism by Ligules in other creatures than birds and fishes is of such rare occurrence that M. Duchamp is inclined to regard such phenomena as accidental. He then refers to the (as supposed by him) only two instances hitherto placed on record, namely the human case and the instance where one was found in a seal, and remarks that even these "are far from being quite certain." What he says respecting the human case is well worth quoting. This instance, he says, "reported by Rudolphi from an observation about the year 1763, concerns a young girl, 25 years of age, [*sic*] who along with *Tænia* appears to have passed fragments of a ligule. Even before the publication of the 'Histoire des Entozoaires,' Bloch had shown how difficult it was to admit the introduction of a living ligule with food, by the experiments undertaken to reply to Rosen of Rosenstein, who supposed that the thing was quite possible, and who had himself seen living ligules in cooked fish (*poissons cuits*)."

The quotation by M. Duchamp is made from Rudolphi's

'Natural History of the Entozoa,' published in 1808; but in my copy of Rudolphi's 'Synopsis,' published in 1819, I find no allusion to the human case. I think indeed, with M. Duchamp that the woman's ligule was not a genuine instance of parasitism by that genus; but from what I have seen of monstrous developments of tapeworms in the human body, I am of opinion that the supposed ligule was a portion of the strobile of a malformed *Tænia mediocanellata*, destitute of segmentation. Prof. Aitken, of Netley, once sent me a complete tapeworm of this kind in which there were neither distinct proglottides nor any true head. The worm might easily have been mistaken for a new kind of ligule.

Whatever interpretation is put upon the case above mentioned, there can be no doubt that in *Ligula Mansoni* we have a genuine cestode parasite, infesting the tissues of man. Its source is difficult to explain; for whilst, with Rosen, we have seen ligules in the flesh of fishes, it is by no means clear that the ingestion of fish-ligules could produce parasitism in man. Indeed it may safely be said that ligulosis could not be produced in this way. If it could, such a disorder would probably not be of rare occurrence. In Italy, it is well known that the sexually immature tapeworms of fishes are relished by the people as edible delicacies. In my copy of Rudolphi, his words are "Ligulæ in pisciculi Cyprino Barbo affinis abdomine obviæ Italis nomine *macaroni piatti* edules et in deliciis sunt." This passage has been freely quoted by Diesing and other helminthologists, including M. Duchamp. It is also worthy of remark that the *Ligula edulis* of Briganti is regarded by M. Duchamp, as it was also by Diesing, as a synonym of *L. simplicissima*.

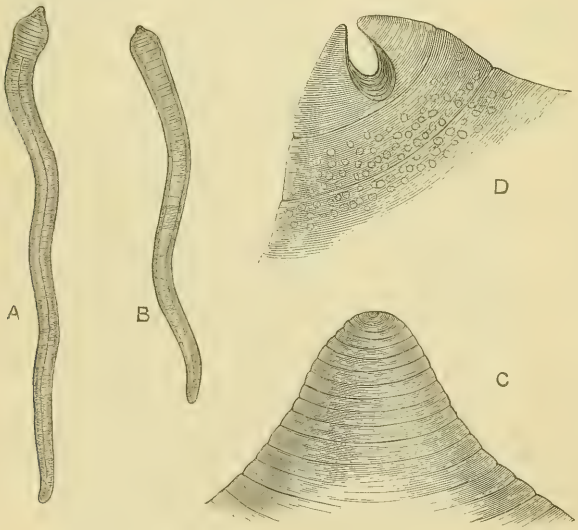
I should be sorry to have misunderstood M. Duchamp; but from his remarks (at p. 34 of his memoir) I am led to infer that the fact of parasitism by ligules having occurred in other mammals than seals has been overlooked by him. He says:— "Concerning the parasitism beyond [or outside] that of birds, one cannot but admit it as an accidental coincidence. Facts of this kind are moreover extremely rare; we have not encountered more than two; and, again, they are far from being quite certain." These words by themelves are explicit enough; and after recording the human instance already quoted by me, he refers to the seal's ligule, which, as he clearly points out, was subsequently shown to be the closely allied Cestode called *Schistocephalus dimorphus*. The perusal of this passage has puzzled me all along; for

M. Duchamp quotes freely, and with uniform accuracy, from Diesing's writings (both from the 'Systema' and his various 'Revisionen'), and yet it is Diesing who refers to *Ligula reptans* as occurring in Reptiles, Amphibia, Aves, and Mammalia. In connexion with the data supplied by Manson's "find," it is interesting to observe that in all the birds and quadrupeds proper, and also in the bats and marmosets in which a ligule has been found, the parasite was always either situated within the muscles or in subcutaneous follicles. This, at least, shows a similarity of habit; and if *Ligula reptans* were possessed of a longitudinal groove and were not furnished with cephalic pits, one might suppose it to be identical with *L. Mansoni*. Again, the external characters rather forbid our connecting the human ligule with *Ligula nodosa* of the trout, though such identity, if proven, might help to explain the origin of *L. Mansoni*.

As already pointed out in my larger treatise, the observations of M. Duchamp, taken in connexion with the embryological studies of the late Dr. Bertolus, render it extremely probable that the trout's ligule is the sexually immature state of the great broad tapeworm of man. If this genetic relation should be established by further researches (as in all probability it will be), it is possible that the proscoleces or six-hooked embryos of *Bothriocephalus latus* might, in place of passing through the ordinary intermediate piscine host, develop as immature ligules within the human body. We know that phenomena precisely analogous to this do actually obtain in the case of *Tænia solium*, the proscoleces developing into scoleces or Cysticerci within the human territory instead of passing into the flesh of swine. In this case the ultimate host becomes also (for the subsequent generation) the intermediary bearer; an act of cannibalism would certainly bring about the completion of the genetic cycle.

In this explanation I cannot take into account the possibility of any Cestode dimorphism such as M. Mégnin argues for so warmly in other cases. I do not believe that it has been proved in any instance of tapeworm life. Here, I think, we are only entitled to conclude that the Chinese host became victimized by his having swallowed the six-hooked embryos of an adult Cestode of some kind or other. In all likelihood the worm was either a *Ligula* or a *Bothriocephalus*. In any case the phenomenon was probably an instance of "straying." If so, we ought to be able to identify *Ligula Mansoni* either with some hitherto known sexually immature ligule or with a form yet to be discovered.

From the investigations of Knoch, of Leuckart, and of Drs. Bertolus and Duchamp, we know that the six-hooked proscoleces of these worms are developed within a ciliated sphere. Thus, Dr. Bertolus proposed that we should call the proscolex the embryo proper, employing his new term *embryophore* to designate the free-swimming, ciliated, nurse-like embryo. It is certain that ponds and streams frequented by water-birds infested with ligules must contain multitudes of these ciliated embryos, and thus (with the explanations already offered as to the genetic relations of the Bothriocephali) we have not far to seek for the cause of infection of dogs and men by the broad tapeworm. In like manner the drinking of any open waters that happen to contain these ciliated larvæ might also bring about infection by ligules. In this way I think we may account not only for the occasional introduction of *Ligula reptans* into the muscles of various mammals, birds, and reptiles, but also for the solitary instance in which a Chinese water-drinker shared with these animals the privilege of harbouring a similar cestode guest.



Explanation of Figures.—Two examples of *Ligula Mansoni*. A, as seen from before; B, from behind (slightly enlarged from spirit specimens); C, papilla of the head (× 15 diam.); D, end of the papilla, showing cephalic pit and calcareous corpuscles. The last figure reduced from a drawing by Dr. Manson (magnified about 80 diam.).